INLAND WATERWAYS NAVIGATIONAL CONFERENCE

Improved Lock/Navigation Structure Inspections (underwater)

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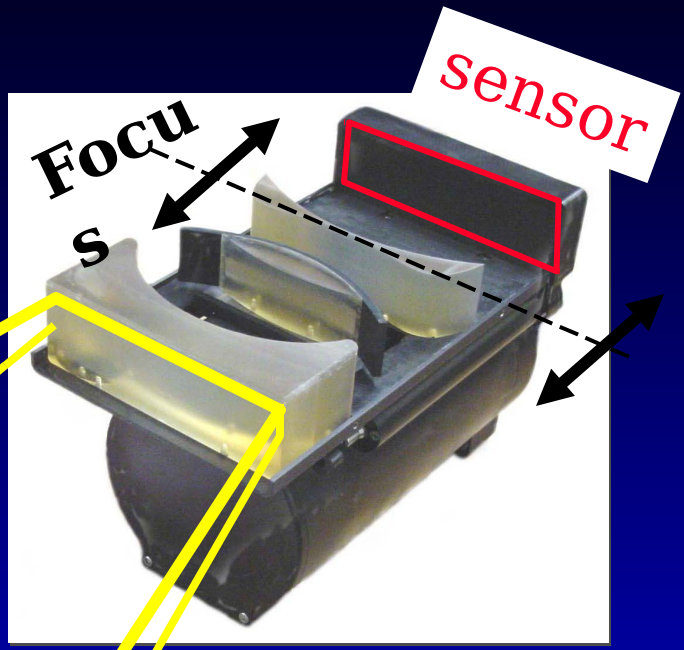
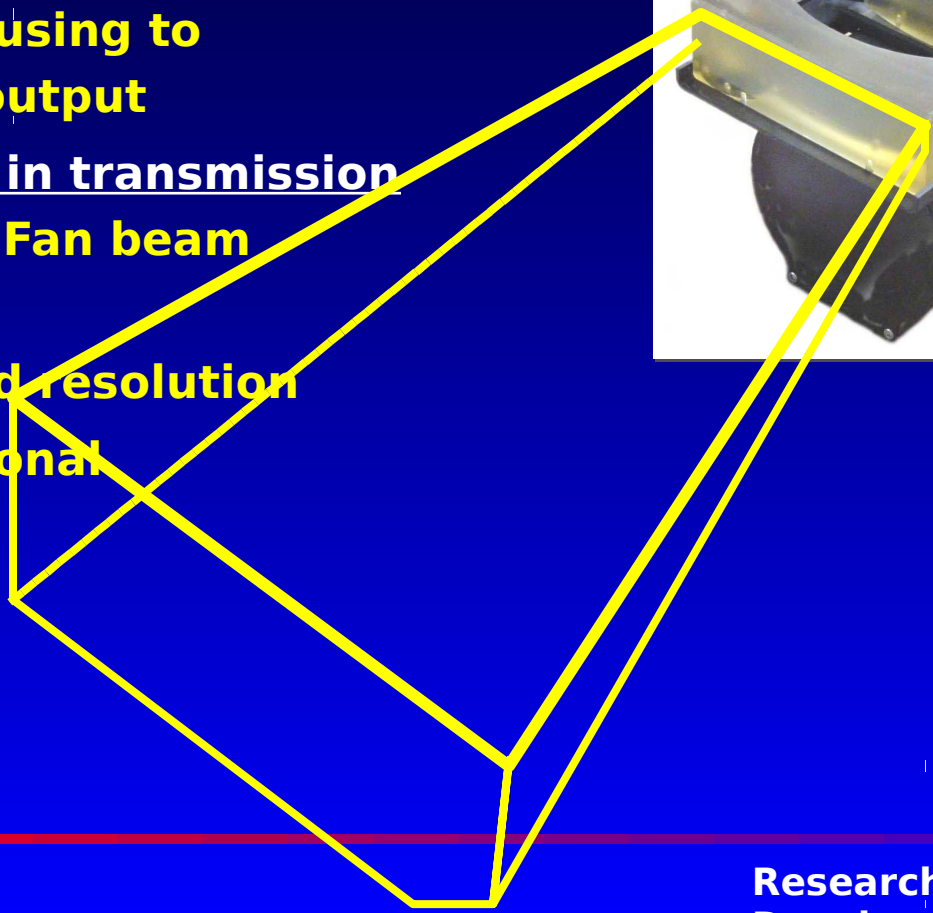
ftp://erdcftp.erdc.usace.army.mil/pub/itl/Imaging%20System/Imaging

Didson Sonar Transducer

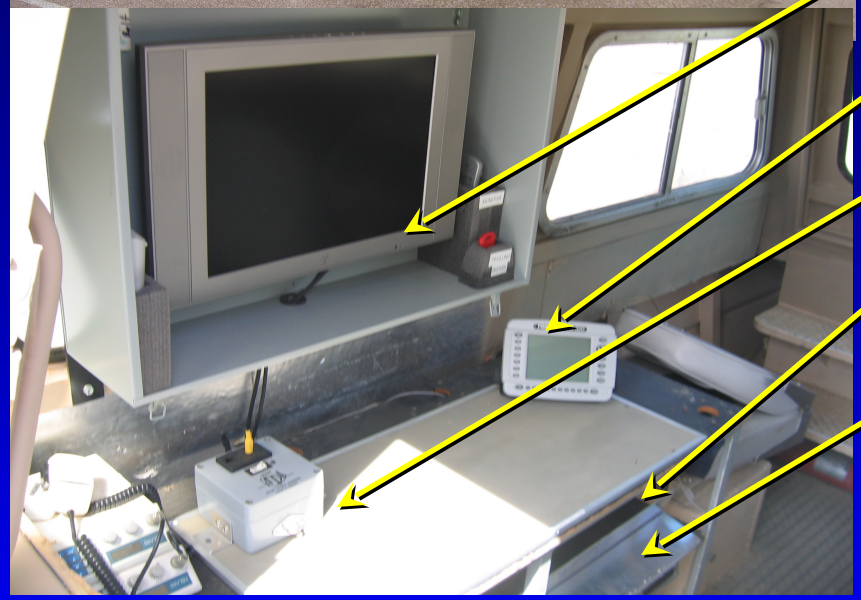
Didson: Background Information

- **Developed at University of Washington for the DOD**
- **Combines high frequency transducer arrays and mechanical focusing to produce video output**
- **Energy <u>focused in transmission and reception</u> (Fan beam shape)**
- **Applications and resolution beyond traditional sonar**





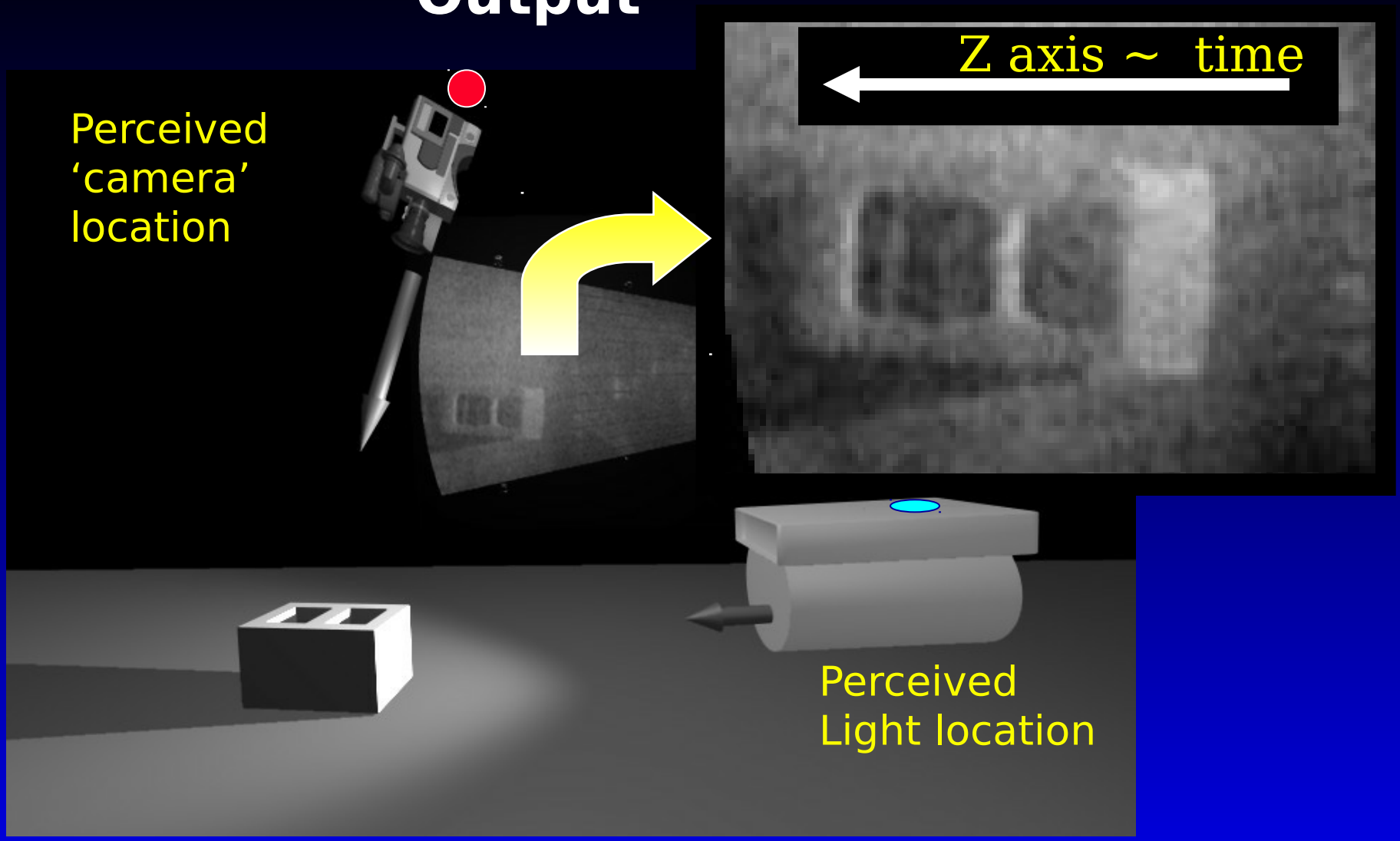
Deployment and Data Integration



Underwater Imaging Sys

- *Electric Motor (closed loop trolling)*
- *Power Generator*
- *Wide Screen Real Time Display*
- *On-Board GPS*
- *Pan and Tilt Control (Joystick)*
- *Acoustic Camera Control*
- *Data Storage (DVD)*
- *ROV*

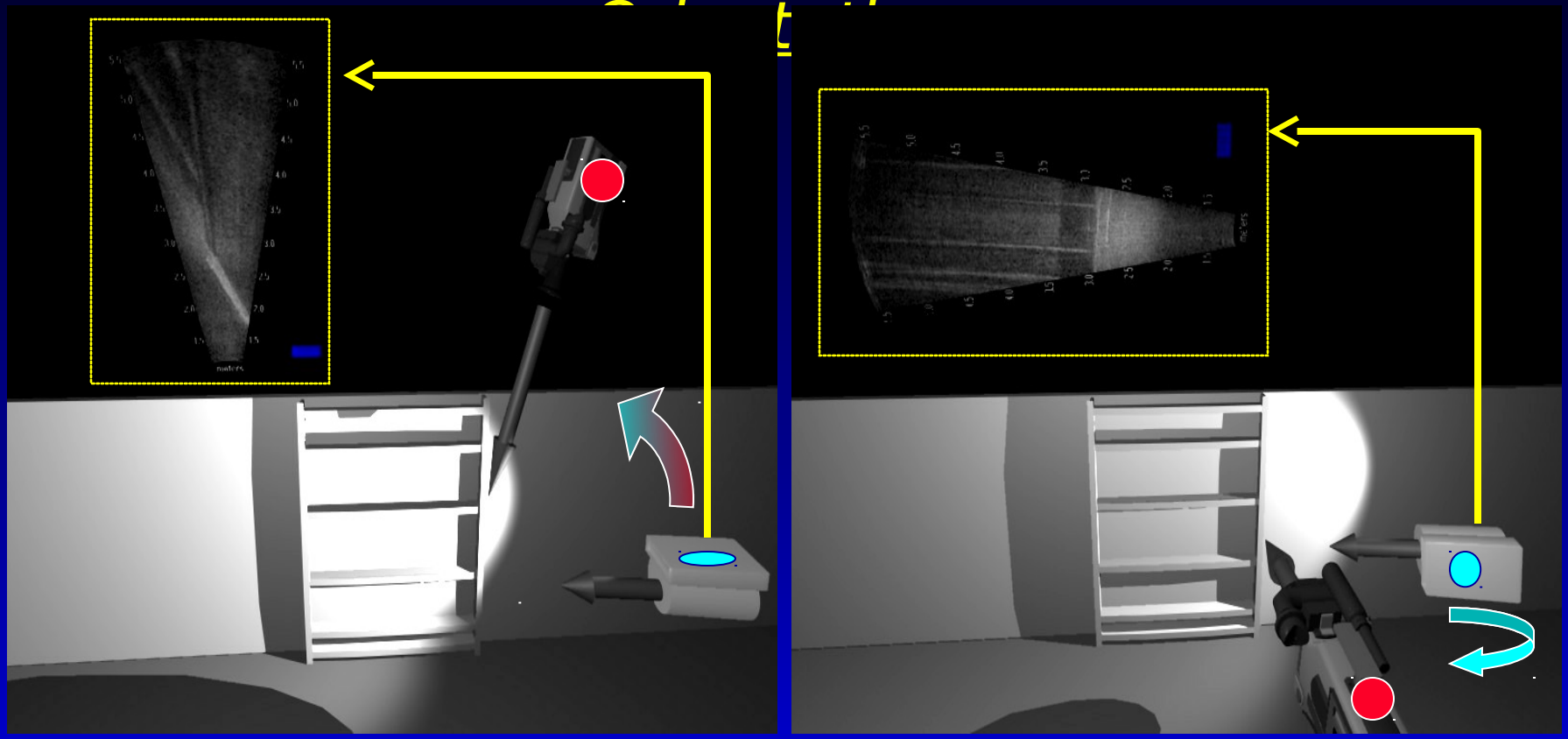
Understanding the Didson's Output



Matching camera and target orientation

Horizontal Orientation

Vertical

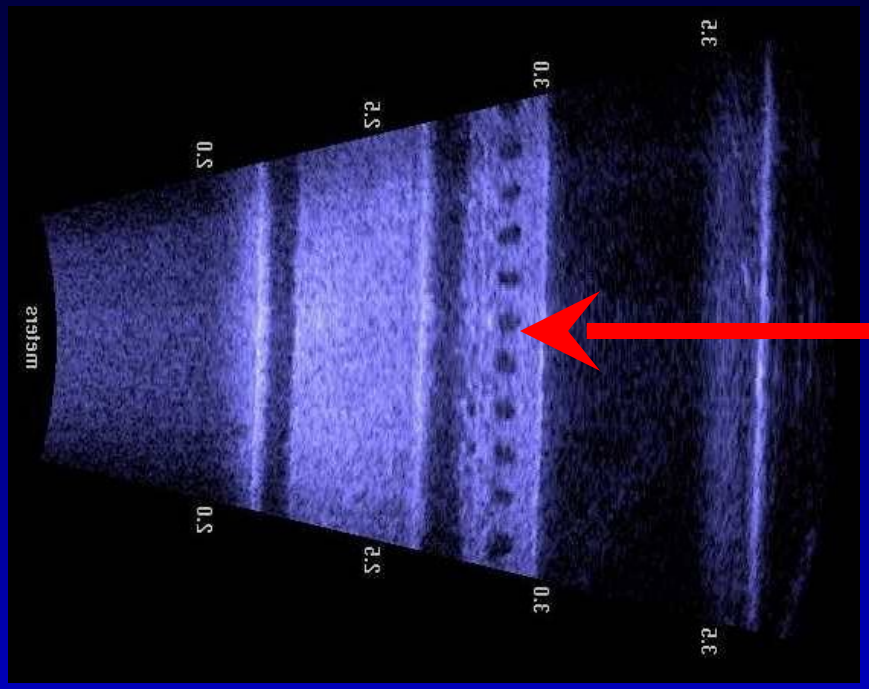


Didson beam-width and resolution are lowest along the narrow dimension of the acoustic lens.

ERDC/St.Louis/Louisville Districts Field Demo

(18 March 02 - Cape Girardeau and Olmstead Lock and Dam)

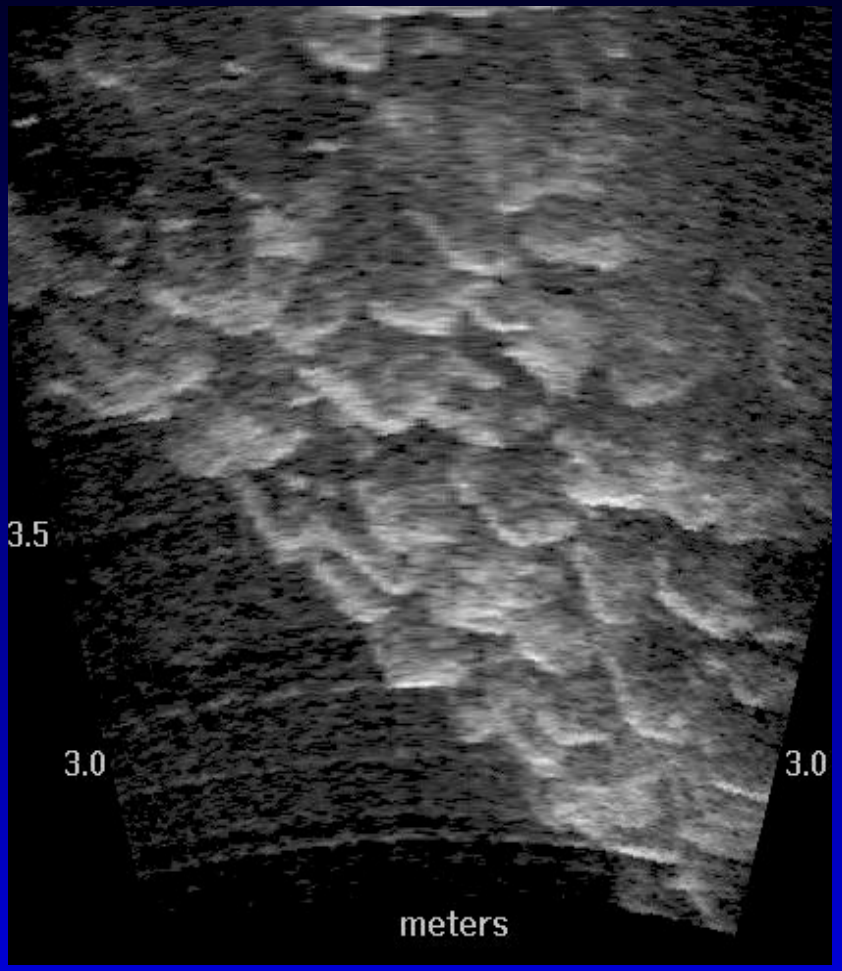
Vertical Orientation



Acoustical Image of Lower Casing End-Plate

Photo of Upper Casing End-Plate

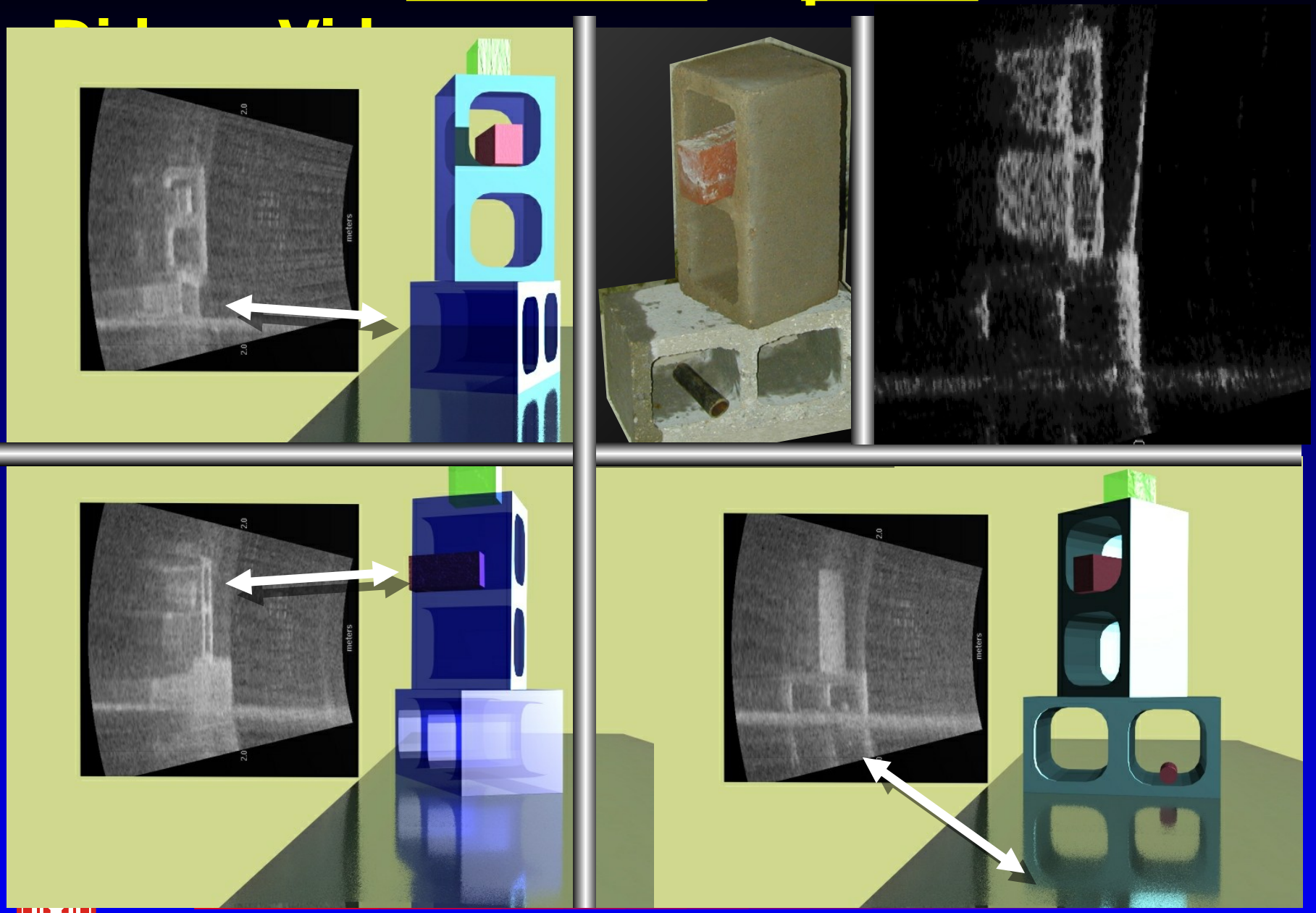
Horizontal Orientation



Objects on concrete floor

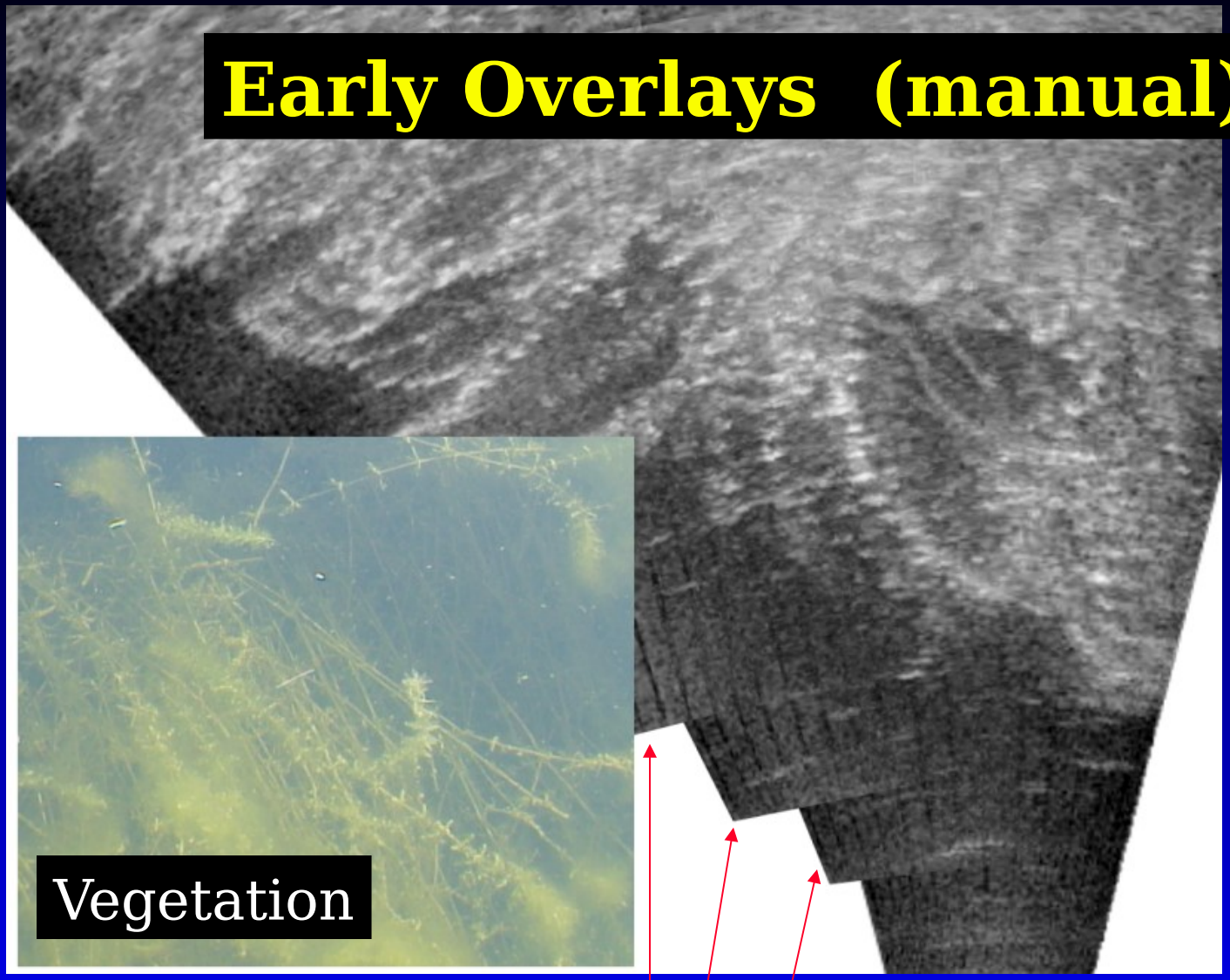
Limestone Rocks

3d model photo

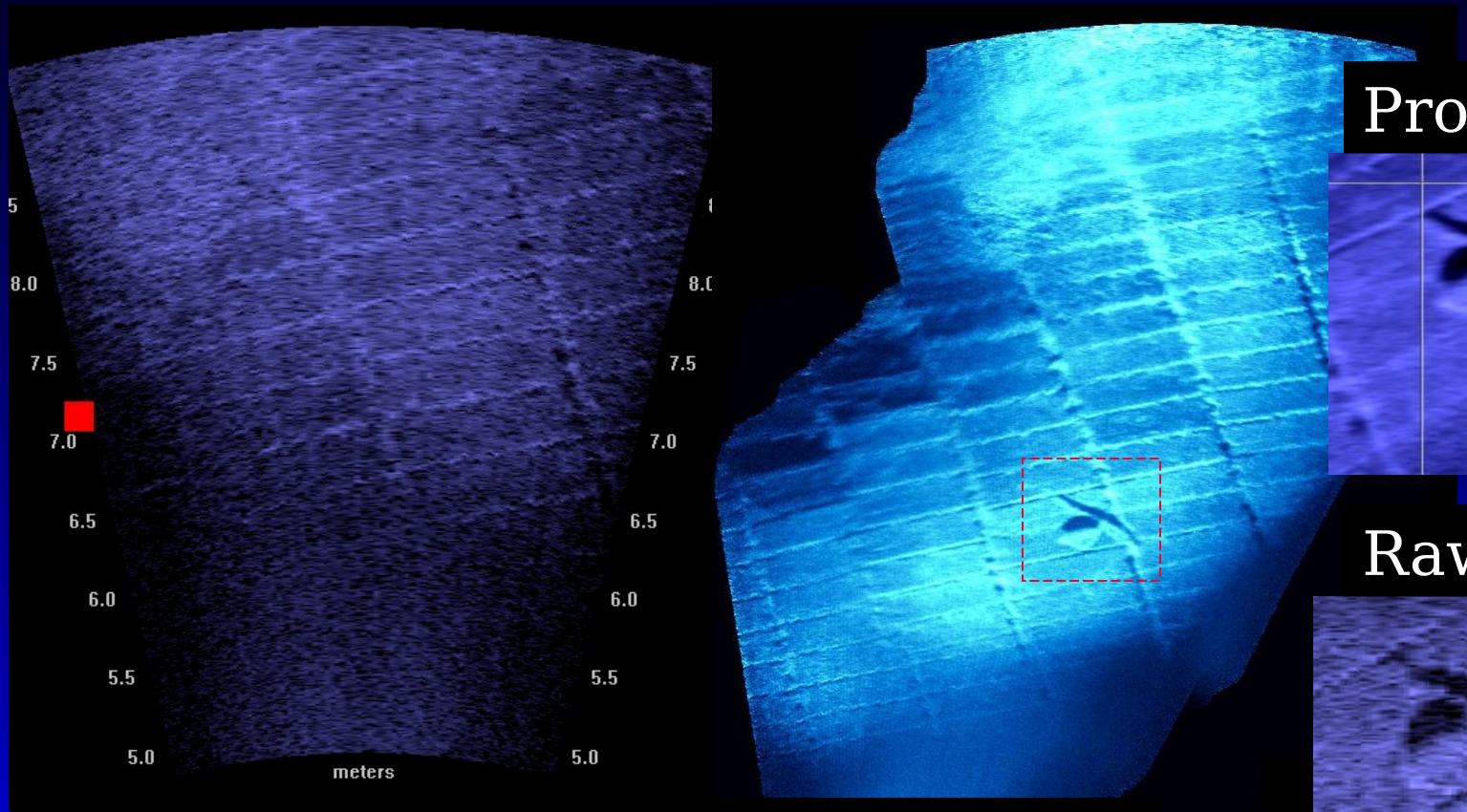


Research and

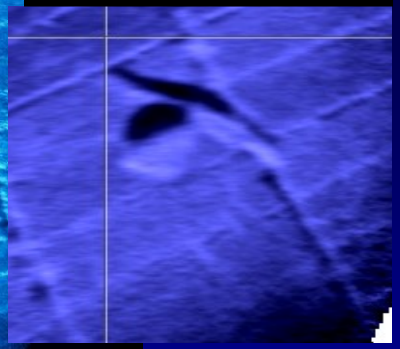
Early Overlays (manual)



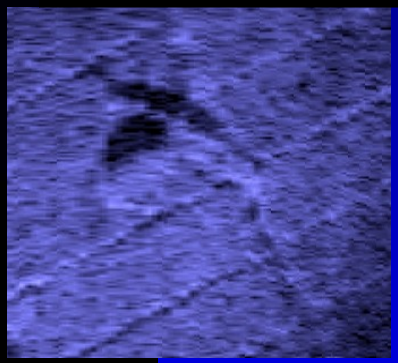
Automated Overlay and Mosaic



Processed



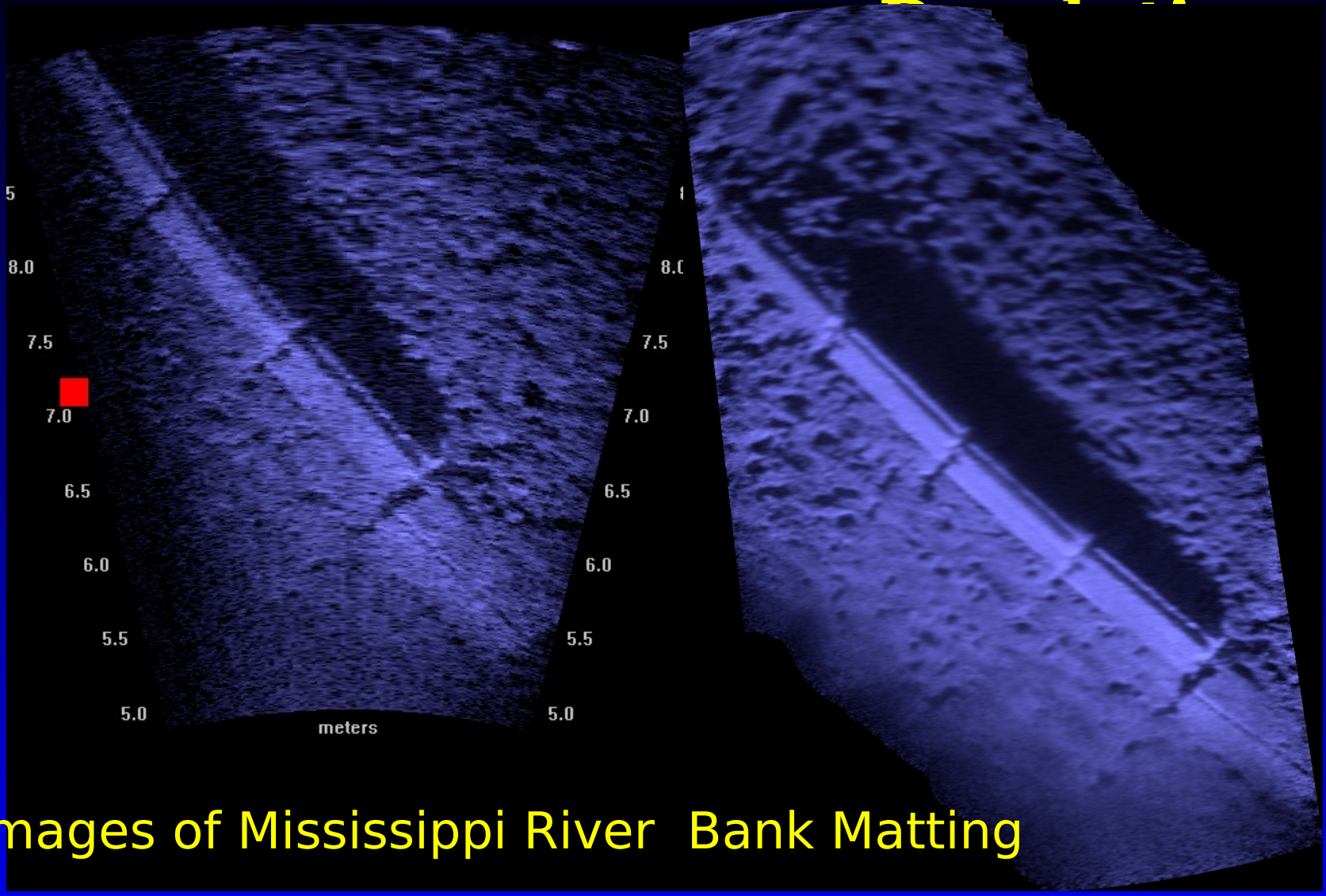
Raw Frame



River Bank Matting

Resolution improved through frame averaging

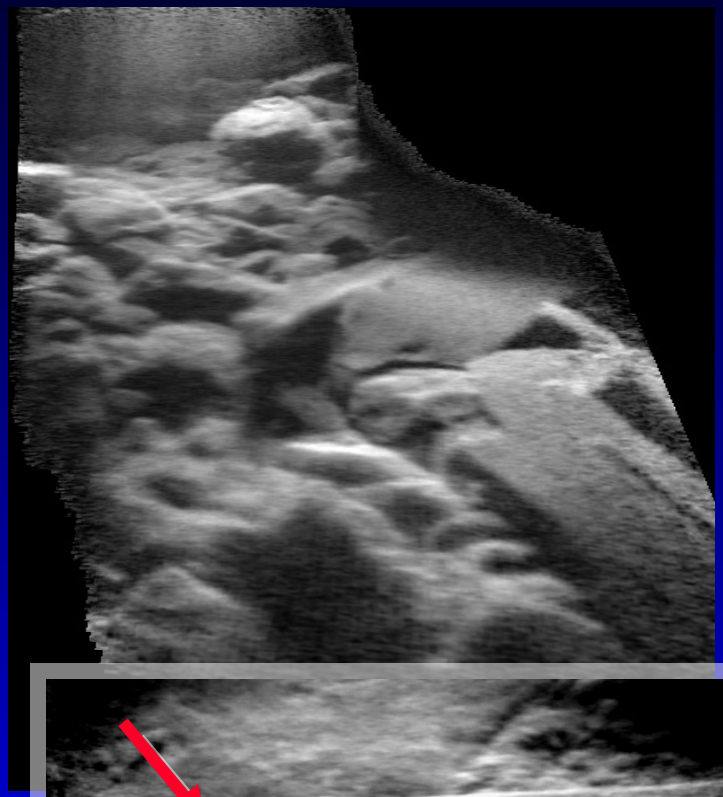
Improved Archive Format and



Images of Mississippi River Bank Matting

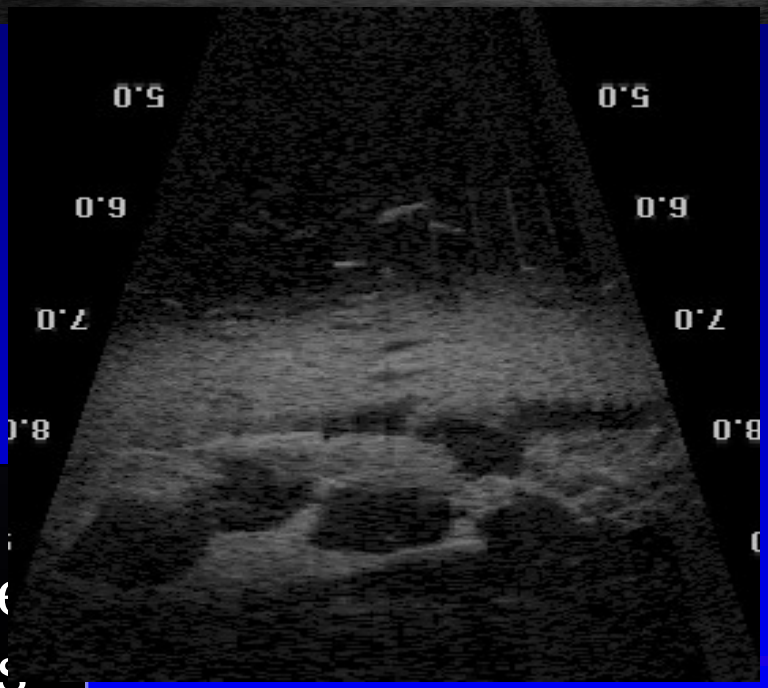
Enhanced Mosaiced Views of various rocks and

Mosaic B



Fish (moving)

Mosaic A



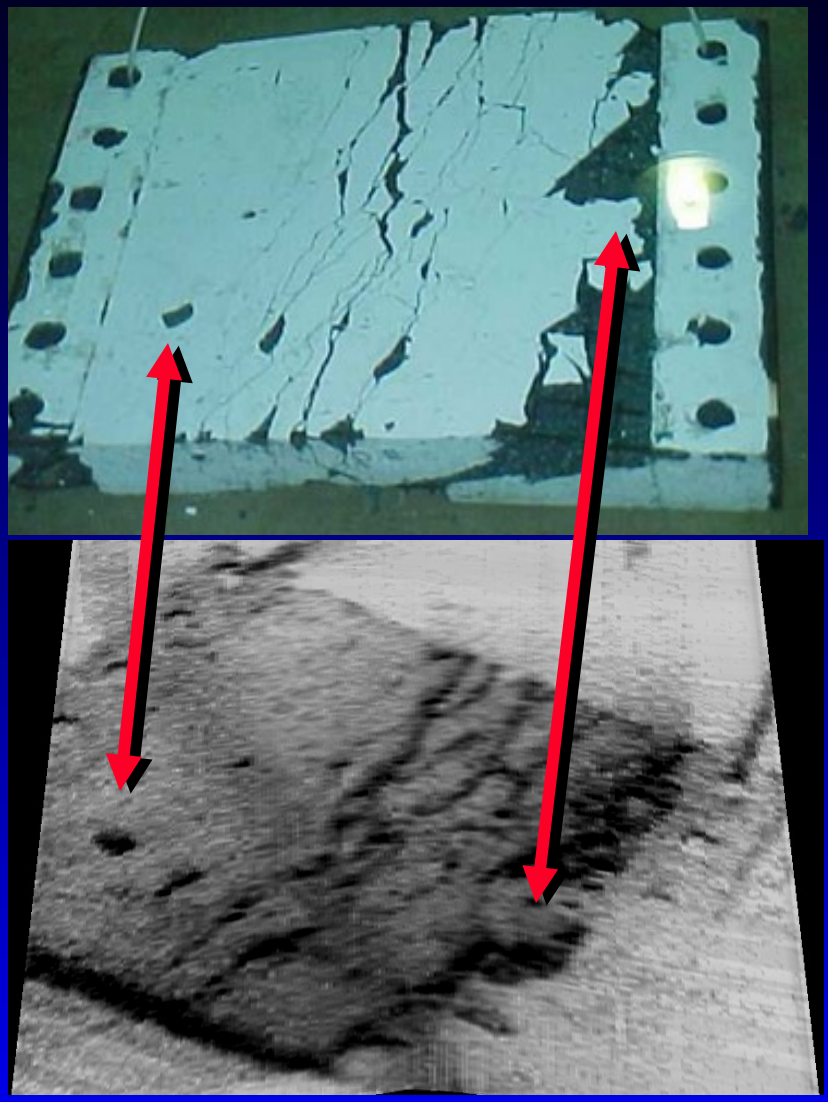
Cast Shadows
- measure distance
- Plane Alignments

Research and

Inspections:

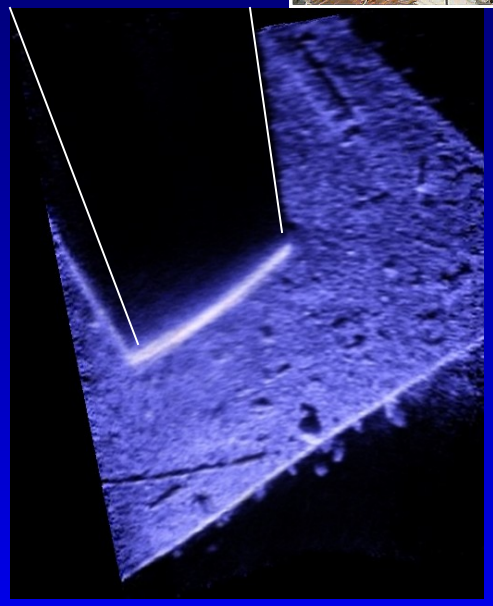
- Deterioration
- Impact damage
- Settlement
- Scour / Debris

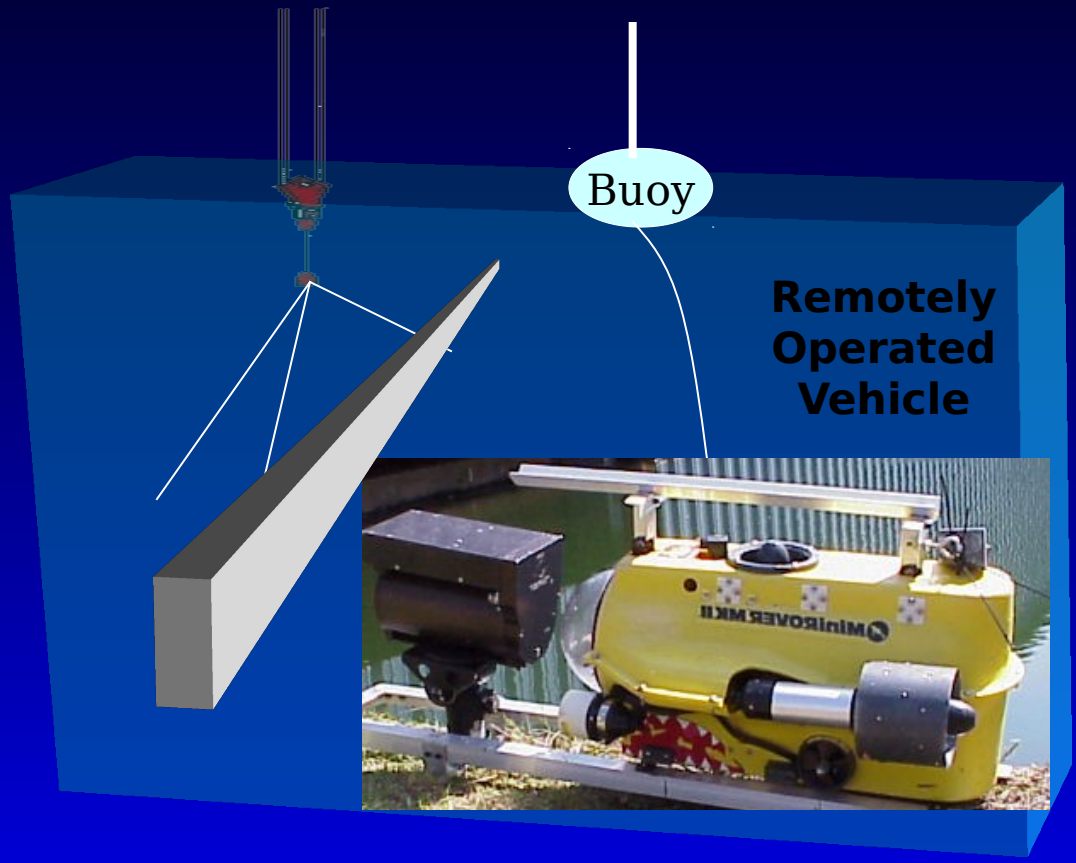
Broken Concrete Plat



Target Applications: Underwater Positionin
Inspections of Structu

- outlet works
- conduits
- toe drains
- penstocks
- pipelines
- dam faces
- Gates
- Locks



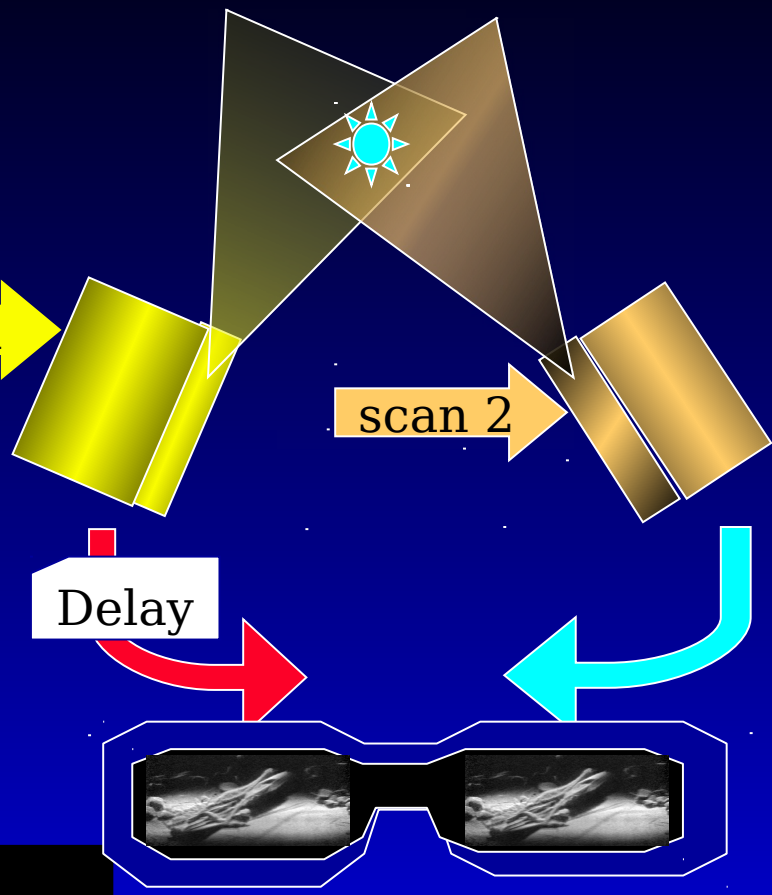


"In the Wet Construction"

Photogrammetry and 3d visualization

- **Real Time 3D**
  Video (15 fps)
  Yaw, pitch, roll
  X,Y,Z (gps)
- **Post Prossed example**
  (High resolution)
  (decreased shadowing)
  (depth enhancement)

Future

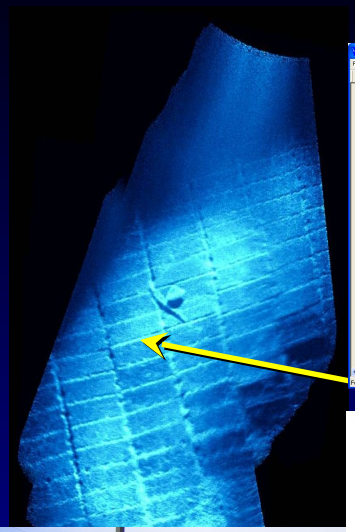


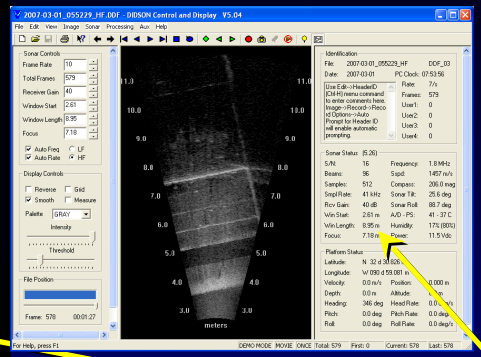
Stereoscopic
LCD Shutters (crystal eye

FUTURE OBJECTIVES

- Photogrammetry
- 3D model extraction (VRML)
- GIS insertion

High Resolution Acoustic Imaging Camera





Summary Where we are NOW:

1) Improving the image using advanced

signal processing.

2) Integrating camera system into a

common platform (boat)

3) Transfer information on the technology to the Corps of

through workshop participation

ftp://erdcftp.erdc.usace.army.mil/pub/itl/Imaging%20System/In